LIBRARY
STATE PLANT BOARD

U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

THE BULB SCALE MITE

By Charles F. Doucette, Division of Truck Crop and Garden
Insect Investigations

Introduction

Ir recert years many stocks of narcissus bulbs have been found infested with a very small mite, the bulb scale mite (Tarsonemus approximatus narcissi Ewing). Some reduction in the quantity of blooms may result from infestation, and the flowers may be so distorted and stunted that they are valueless. Under some conditions the bulbs go through their seasonal development with the mite populations remaining at a very low level, and injury or symptoms of attack are not observed; hence a grower is not likely to detect the mite's presence in his stocks. Frequently, however, conditions become favorable for rapid development of the mites, and the populations in the bulb may increase very rapidly and cause very serious injury.

Infestations may be present in any region to which narcissus is adapted. The mites have been reported in many producing areas and have undoubtedly been carried to many localities on bulbs moving in regular commercial channels. The mite is reported as present in stocks in England, and bulbs from Holland have been found infested. No varieties of narcissus are known to be immune. The mite also attacks several other bulbous species of the family Amaryllidaceae.

Injury Caused by the Bulb Scale Mite

Symptoms of injury do not become apparent until the populations in the bulbs become excessive, and consequently in places where cool growth conditions prevail the mites may be present for a long time without being detected. In general low temperatures retard development, moderate temperatures accelerate development, and high temperatures probably kill most of the mites. The most rapid development takes place between 60° and 80° F. Temperatures of 95° or above, if continued for several days, probably kill all the mites. Below 60° the mites exist but do not develop rapidly, and the populations in the bulbs remain more or less stationary at a very low level.

LIBRARY
STATE PLANT BOARD

The mites feed principally on the epidermal surfaces of the bulb scales and of the leaves in the "neck" area of the bulb. The top, or neck area. of the bulb is the focal center of an infestation. During the growing season the mites concentrate in this spot, their activity extending upward to the point where the leaves separate, usually above the soil-surface line. Wherever sufficient space is available between scales and between leaves the mites work their way in. The new shoots developing inside the bulbs during the storage period are at first enclosed in thin sheaths, which separate as the tips of these shoots approach the tops of the bulbs, thus allowing the mites to enter. This stage of bulb development comes late in the summer (late August and early September), when temperature conditions are particularly favorable for the mites. If the favorable conditions continue for any extended length of time, the new growth may be seriously affected. It is this particular injury which is most important, as it causes the reduction in number of flowers and the distortion and stunting of the flowers that do develop. The mites feed in the neck of the bulb, and as the leaves and stems grow away from this point the areas of feeding become dry, resulting in scarlike yellowish-brown streaks. Frequently there are short transverse cracks in the scarred areas, and distortion and twisting of a varying degree are usually associated with this scarring, for the uninjured side of the stem or leaf grows fast whereas the mite-injured portion is slowed down in growth. Often where infestation is less severe the only symptom evident may be a slight twist of the flower stems amounting to about one-fourth or one-half a turn between the bulb and flower.

The injury by this mite may be confused with that caused by mosaic disease and the bulb nematode. All leaves of plants affected by mosaic disease show streaks and irregular areas of pale green or yellow, giving a striped or mottled appearance. The mottled areas are sometimes roughened. but do not have the scarred tissue as do the mite-injured leaves. Injury by the bulb nematode is recognized by the presence of small thickenings in the leaves called "spikkels." These are easily detected by drawing the leaves between the thumb and forefinger. Pale green spots and bands on narcissus foliage may also result from frost injury after the leaves emerge and also from improperly timed hot-water treatment. However, the surface of these areas is usually not roughened.

On the flowers, mite injury causes pale-yellow, often thin, and somewhat sunken, streaks, or the entire flower may be deformed and stunted.

On dormant bulbs there are no external indications of the presence of these mites. Infestation within the bulbs is evidenced by moderately dark yellowish-brown areas on the normally white scale tissue. A bulb must be cut open from neck to base and the scales and shoots separated in order that these discolored areas may be seen. Usually these areas occur where there is naturally a slight separation of the scales, and the discolored areas are mostly likely to be found on the edges of that scale which represents the flower stem of the preceding spring.

Description and Development

The mites are exceptionally small and are not discernible without the aid of a microscope. The adult mites are only 1/125 of an inch long. Groups of considerable numbers look like a scattering of fine grains of very light-colored sand. White six-legged larvae are hatched from the white oval-shaped eggs and develop until they assume a quiescent form. During this quiescent larval stage changes in the mite occur which are equivalent to those occurring in the pupal stage in insects, after which the eight-legged adult mites emerge. Both sexes are light tan in color. The complete development takes place on the plant, and many of the mites may go through their complete life without moving a distance of one-half inch from the point where they emerged from the eggs. The females have a tendency to deposit eggs in narrow crevices, and the larvae seek similar places before they enter the quiescent stage.

Spread among growing bulbs is relatively slow, a few feet being the usual limit during a season. However, in storage, where the bulbs are concentrated in trays or similar containers, infestation may become widespread in a stock even though the initial infestation may have been relatively very small.

Injury is associated with high populations of mites in the bulbs. Approximate counts made of the mites in dormant bulbs have indicated the presence of several thousands in individual bulbs previous to planting. It has also been demonstrated that populations can build up to serious numbers within a period of approximately 2 months, under favorable conditions. If the conditions continue to be favorable, these numbers are probably increased considerably during the period of early growth of the plant. However, when the environment of the planted bulb is not favorable, the populations drop to a few hundred per bulb, a level much below that which causes injury.

Control

To control this mite, dependence must be placed on thermal treatments. Eradication should be the objective and is easily attained if proper precautions are observed. Bulb producers who have been following a regular thermal treatment schedule for their stocks have had little trouble with this pest. Immersion of the bulbs in hot water at 111° F. for 1 hour, in addition to the time required for the bulbs to reach that temperature, results in complete kills of all stages of the mites, with sufficient allowance for any variations which might occur in ordinary procedure. Treatment of bulbs for nematode infestation or as a precaution against such infestation naturally is effective against the mites, for the standard duration of treatment recommended for this pest is 4 hours at 111°. Normally 20 to 40 minutes is required for the bulbs to reach the treating temperature after they have been placed in the hot water. This period added to the suggested treating period of 1 hour makes the total immersion time required approximately 1½ hours. This period of treatment is also sufficient to kill all stages of the ordinary bulb mite (Rhizoglyphus hyacinthi Bdv.) and the

larvae of the narcissus bulb fly (Merodon equestris (F.), the lesser bulb fly (Eumerus tuberculatus Rond.) and other bulb flies (Eumerus spp.)

Treatment of Large Quantities of Bulbs

Equipment for hot-water treatment is in general use by most narcissus bulb growers. Rectangular tanks are customary, the heating of the water being accomplished by steam, either through coils or by direct injection into the water. Circulation of the water is accomplished by motor-driven propellors. To hold the bulbs, specially constructed wire-mesh containers or standard-type shipping crates are used.

Treatment of Small Quantities of Bulbs

If there is only a small quantity of bulbs to be treated, a washtub or similar container may be used satisfactorily. Continuous attention is required to maintain the water temperature within the desired limits, but where only one or two treatments are needed the expense of special equipment is avoided. When this type of equipment is used, the bulbs should be placed in open-weave sacks (onion type) or in cheesecloth bags, and these should be placed loosely in the water. Tight packing should be avoided, because it hinders the circulation of the water among the bulbs. At the start the water in the container should be at a temperature of 113° or 114° F. The immersion of the bulbs in the water will lower the temperature to the desired treatment point, 111°. Small quantities of hot water (150° to 180°) added at frequent intervals will maintain the temperature at the desired point with only slight variation. Actual trials when the air temperature was 75° to 80° have demonstrated that additions of approximately 1 pint of hot water (160° to 180°) at 10-minute intervals maintained the temperature of the water in a tub with less than one degree variation above or below the treatment temperature.

Regardless of the type of treating equipment used, it is essential than an accurate thermometer, graduated in single degrees, be used to determine the temperature of the water.

Vapor-heat treatment is likewise effective as a control measure for the mites. However, this requires special equipment and is economically practical only for large-scale operations. A vapor-heat treatment of 2 hours at 111° in addition to the time required for the bulbs to become heated to that temperature, will give complete kill of all stages of the bulb scale mite.

Time of Treatment

The most desirable time to treat narcissus bulbs is from 3 to 4 weeks after digging, assuming that the bulbs are dug at the normal time, shortly after the foliage dies. The wet bulbs should be spread out immediately

after treatment to permit rapid drying, otherwise damage by molds and similar detrimental organisms will be likely to occur.

As it is not advisable to apply hot-water treatment to bulbs which are to be sold, bulb producers should treat their planting stock from which bulbs are to be selected for sale the following season. In addition proper precautions should be taken to avoid contamination from any other stocks that might be infested.

UNIVERSITY OF FLORIDA
3 1262 09224 7583